Chem 134 W20 **Rec. Ex. 7** **Name**: _____

Lab sec: _____

Due beginning of recitation March 10 or 11. Answers and work must be shown on **these sheets** which must be **stapled** together (or double-sided).

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Refer to the Ch. 6A lecture slides or the textbook to answer the following questions.

1. **Energy** is defined as the ***capacity to do*** _____. **Work** is a _____ acting over a _____. The SI unit of energy is the joule. **1 J** = _____

3. **Thermal** energy is a form of (*potential, kinetic*) _____ energy. It is the energy of _____

4. **Potential** energy is _____ energy… it has potential to do _____.

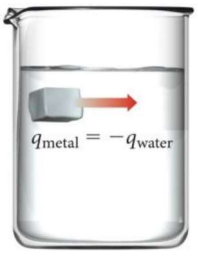
5. Briefly explain **chemical potential energy**.

6. Systems with high potential energy:

_____

_____

7. A piece of warm metal is dropped into a beaker of cold water. Briefly explain the process that occurs and the equation in the diagram.



8. a) How does the energy unit **calorie** compare to the **joule**? A calorie is more than (*insert a number*) _____ times (*larger/smaller*) _____ than a joule.

b) How does the **calorie** compare to the food **C**alorie? A food **C**alorie is (*insert a number*) _____ times (*larger/smaller*) _____ than a **c**alorie.

9. Define internal energy: _____

   a) Internal energy is **changed** through the **transfer** of _____ and _____

   b) Write the equation for **change** in internal energy and define the terms in the equation.

10. a) Briefly explain how chemicals do work. What type of substances are involved?

    b) Write the equation for P-V work and define the terms in the equation. Why does it have a minus sign?

11. a) If a cold pack is placed on a person's skin, it feels cold because _____

    _____

    b) Identify the system _____ and surroundings _____ in the above process.

    Fill in each blank with one of the following: *exothermic, endothermic*; *system, surroundings; absorbs, releases*

    The process is _____ since the _____ _____ heat.

12. a) Define **heat capacity** and give its units.

    b) Define **specific heat** capacity and give its units.

13. The larger the heat capacity or specific heat, the (*more/less*) _____ heat it can absorb and the (smaller/larger) _____ its temperature will change. Refer to Table 6.4: Equal masses of **Pb** and **Fe** absorb the same amount of heat. Which will have the **smallest** temp rise?

14. a) Write the equation for calculating **heat** and define each term in the equation.

    b) Is it necessary to convert temperature to **K** in this equation? Briefly explain.

Problems: Clearly show work, including **units**, and **equations** (if any)**.** Decimals beginning with zero must **show the zero**. Give final answers with correct sig. figs. and box your answers.

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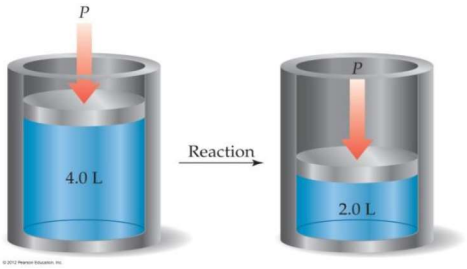
15. The cylinder in the diagram contains a gas in which a process occurs at constant temperature and pressure.

a) Is work done ***by*** or ***on*** the system? _____ What is the sign of **ΔV**? _____ sign of **w**? _____

b) **Write the equation** and calculate the work in **joules** if the external pressure is 825 torr.
1 L atm = 101.3 J 1 atm = 760 torr



16. A balloon is cooled by removing **0.784 kJ** of heat. It shrinks on cooling, and the atmosphere does **655 J** of work on the balloon. **Write the equation** and calculate the **change in internal energy** of the system.

17. A 70.0 g sample of aluminum is initially at 23.5 ◦C **Write the equation** and calculate the ***final temperature*** if the sample **absorbs** 3.65 kJ of heat. The specific heat of Al is 0.903 J/(g°C)

18. A 70.0 g sample of aluminum is initially at 23.5 ◦C **Write the equation** and calculate the ***final temperature*** if the sample **releases** 3.65 kJ of heat. The specific heat of Al is 0.903 J/(g°C)

19. A volume of 150.0 mL of H_2O is initially at 24.00 ∘C. A chilled steel rod at 2.50 ∘C is placed in the water and the final temperature of the system is 21.20 ∘C. **Write the equation** and calculate the **mass** of the rod.
specific heat of water = 4.184 J/(g·∘C) specific heat of steel = 0.452 J/(g·∘C)

20. A 0.6057 g sample of octane, C_8H_{18}, is placed in a bomb calorimeter with a known heat capacity of 12.1 kJ/°C. The octane is ignited in the presence of excess oxygen and the temperature of the calorimeter increases from 25.03 to 27.45°C.

a) Calculate the heat absorbed by the calorimeter.

b) Calculate ΔE in kJ per mole of octane.